

CPAP Compliance Study and Circadian Rhythm Disorders

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A 63-year-old male with 15-year history of severe obstructive sleep apnea (OSA) (apnea-hypopnea index of 87/h) on continuous positive airway pressure (CPAP) therapy at 7 cm H₂O, presents to the sleep clinic for routine follow-up. Self-reported tolerance and compliance at current settings are excellent. His wife has not witnessed any apneas or snoring episodes. Additionally, patient denies any somnolence at work and states his level of alertness has significantly improved after starting CPAP use. Patient was lost to follow-up for a period of 5 years; on a subsequent follow-up visit he had data downloaded from the

device. Compliance and use pattern data are presented in **Figures 1** and **2**.

QUESTION: What does the compliance and use pattern represent in Figures 1 and 2?

- A. Irregular CPAP use
- B. Sleep phase delay
- C. Shift work
- D. Sleep phase advance

Figure 1—Compliance information

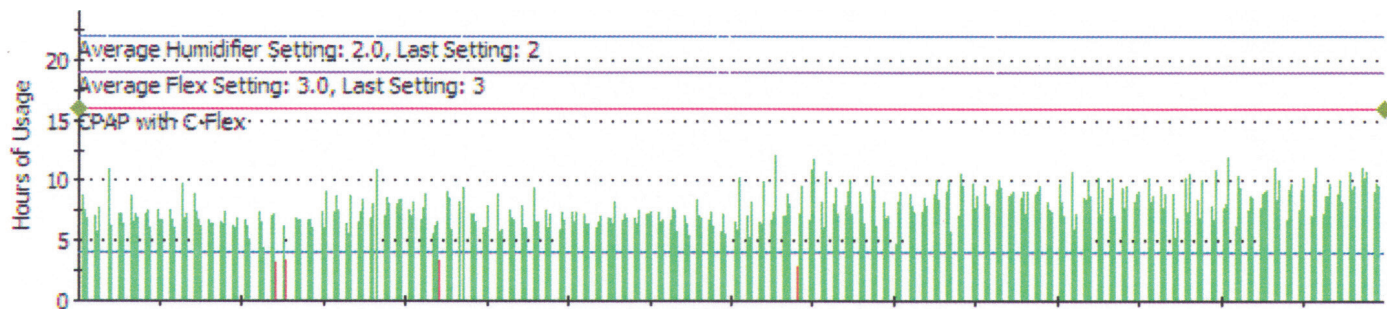
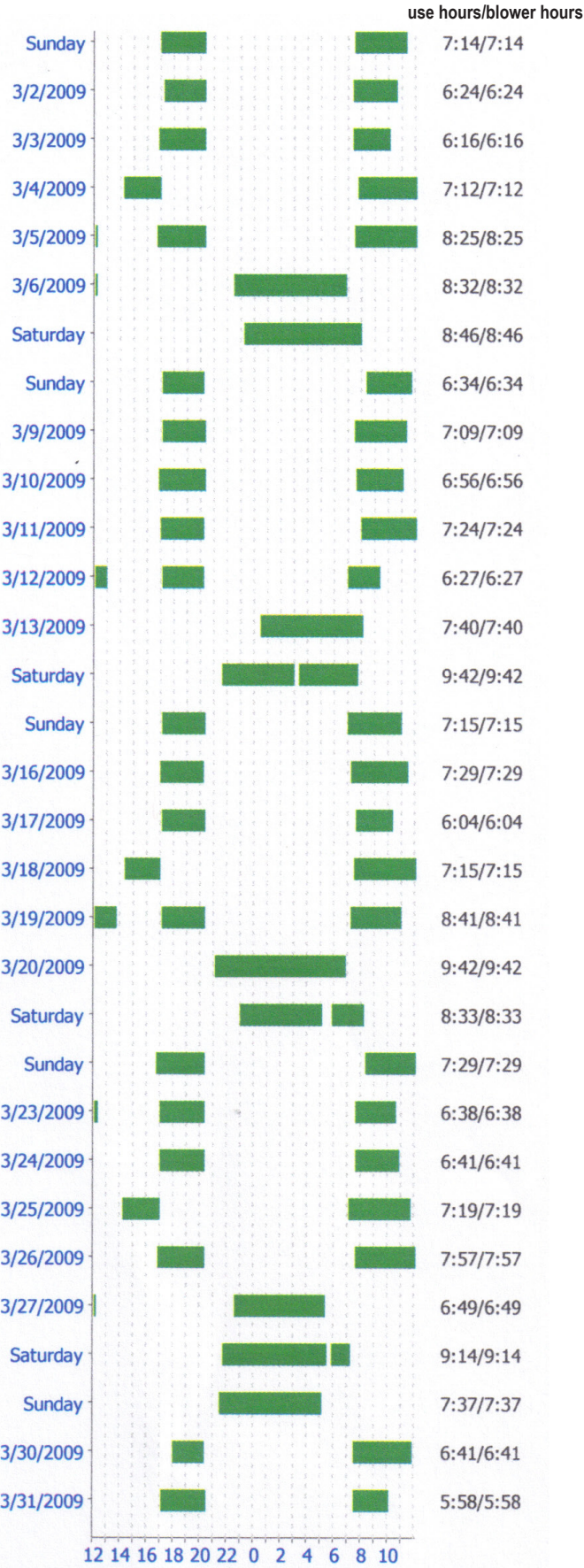
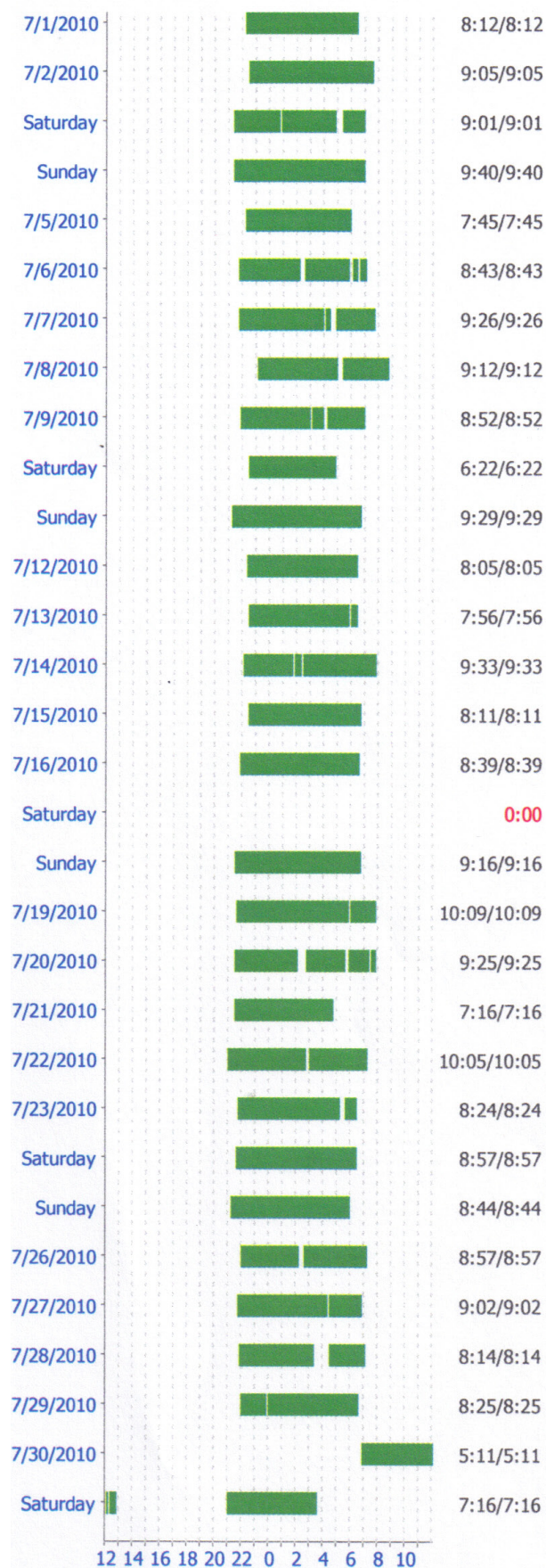


Figure 2—Night-to-night compliance



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Figure 3—CPAP compliance data after retiring from work



ANSWER: C. Shift work

DISCUSSION

This case clearly demonstrates a common but easily overlooked pattern seen in shift workers. Our patient worked night shifts as a printing press operator. His initial CPAP usage data reveals a bimodal distribution of use during the day, where he slept for a few hours in the morning and some more in the afternoon before his night shift (Figures 1 and 2). He worked 5 days as a night shift worker and then returned to a “normal schedule” over the weekend, where he slept during the night for an average of 8-9 hours. The hours of sleep on the weekends (i.e., during the normal schedule when he was not working his shift) were greater than during the weekday shift work. This was probably related to sleep deprivation and inadequate sleep during the night shift work that was being compensated by increased sleep duration on the weekends when he was off the shift work.³ REM sleep occurs predominantly during the early morning hours. Since our patient works the night shift on the weeknights, he is probably experiencing REM rebound when he falls asleep in the morning after returning from work. As he used his CPAP during this time period, he most likely addressed any untoward side effects related to this REM rebound. In the latter years after retiring from work, his CPAP use data reveals a change to predominant nighttime use (Figure 3).

In the May 2004 Current Population Survey, the U.S. Census Bureau conducted a “Work Schedules and Work at Home” supplemental survey to assess the proportion of people that worked nontraditional shifts that included questions on flexible work schedules, shift work, reasons for working particular shifts, and the beginning and ending hours of work. According to this survey, 14.8% of full-time U.S. wage and salary workers worked an alternate shift outside of the standard 6 AM to 6 PM daytime work hours. The most prevalent shift was the evening shift (4.7% of U.S. workers) followed by 3.2% of workers on the night shift.¹

Individuals who work non-standard shifts, particularly those who work at night or early-morning shifts, may be susceptible to shift work sleep disorder (SWSD), a circadian rhythm sleep disorder. The diagnosis can be made from a thorough history and confirmed with a sleep diary or actigraphy. According to the International classification of Sleep Disorders, second edition (ICSD-2), SWSD is characterized by the following: (1) A complaint of insomnia or excessive sleepiness that is temporally associated with a recurring work schedule that overlaps the usual time for sleep; (2) Symptoms are associated with the shift-work schedule over the course of at least one month; (3) Sleep log or actigraphy monitoring (with sleep diaries) for at least 7 days demonstrates disturbed circadian and sleep-time misalignment; and (4) The sleep disturbance is not better explained by another current sleep disorder, medical or neurological disorder, mental disorder, medication use, or substance use disorder. Apart from insomnia leading to possible drug and alcohol dependency, fatigue and excessive sleepiness during shift work are commonly reported in patients with SWSD.²

Though our patient showed evidence of shift work on the compliance data use pattern, he did not show symptoms of SWSD. This case illustrates the importance of reviewing the compliance use pattern, as it may provide information regarding patient's sleep-wake cycle patterns and provide more objective information than sleep diaries.

Shift work sleep disorder can cause or worsen hypertension, which is a major risk factor for cardiovascular disorders.⁴ This can be further aggravated if there is associated OSA in shift workers.⁵ However, the association between cardiometabolic outcomes in shift workers with OSA and the effects of CPAP treatment on these outcomes are unknown and will need to be studied further in future trials.

CLINICAL PEARLS

1. Compliance and use pattern data downloaded from the CPAP device can provide useful information on the patient's sleep-wake cycle pattern.
2. The clinician should review the pattern of use on the CPAP device download data and not just the total hours of use.
3. Compliance data and use pattern can provide more reliable information than subjective data from sleep diaries filled out by patients. It can be used in lieu of actigraphy, though further data comparing these two are needed.

CITATION

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